

Claims

- [c1] 1. A voltage controlled oscillator comprising:
- a. an oscillator circuit comprising an LC tank circuit and first and second transistors connected in a negative resistance configuration across the LC tank circuit, wherein the oscillator circuit generates an oscillator voltage proportional in frequency to an input control voltage and proportional in amplitude to an input control current;
 - b. a current source circuit coupled to the oscillator circuit that supplies the input current to the oscillator circuit;
 - c. a bias circuit coupled to the current source circuit that biases the current source circuit; and
 - d. a feedback loop coupled between the bias circuit and the oscillator circuit, wherein the feedback loop comprises an amplifier having a high input impedance that is coupled to sense the oscillator voltage and output a current proportional to a positive peak of the oscillator voltage to reduce current flowing into the oscillator circuit from the bias circuit by enough to control the level of swing of the oscillator voltage to a desired level.
- [c2] 2. The voltage controlled oscillator of claim 1, wherein the amplifier comprises first and second transistors each set nominally in cut-off, bases of the first and second transistors being coupled to the oscillator circuit to sense an amplitude of the oscillator voltage.
- [c3] 3. The voltage controlled oscillator of claim 2, and further comprising resistors coupled to the emitters of the first and second transistors, wherein the first and second transistors sense when the amplitude of the oscillator voltage reaches the desired level set by values for the resistors.
- [c4] 4. The voltage controlled oscillator of claim 3, wherein the first and second transistors are responsive to the amplitude of the oscillator voltage reaching the desired level to turn on briefly and draw current away from the bias circuit.
- [c5] 5. The voltage controlled oscillator of claim 4, wherein the bias circuit comprises first and second transistors whose bases are coupled together, a

diode having an anode coupled to the base of the first transistor and to the collector of the second transistor, and a current source coupled to the cathode of the diode, wherein a connection is made between the collectors of the first and second transistors of the amplifier and the cathode of the diode in the bias circuit to provide a path to draw current away from the second transistor in the bias circuit.

- [c6] 6. The voltage controlled oscillator of claim 2, wherein the oscillator circuit comprises an LC tank circuit comprised of two inductors coupled to two varactors, and wherein the first and second transistors of the oscillator circuit are PMOS transistors.
- [c7] 7. The voltage controlled oscillator of claim 6, wherein the base of the first transistor of the amplifier is coupled to the gate of the second transistor of the oscillator circuit and the base of the second transistor of the amplifier is coupled to a node between one inductor and one varactor in the LC tank circuit.
- [c8] 8. The voltage controlled oscillator of claim 1, wherein the amplifier is a class C amplifier.
- [c9] 9. A voltage controlled oscillator comprising:
 - a. an oscillator circuit comprising an LC tank circuit and first and second PMOS transistors connected in a negative resistance configuration across the LC tank circuit, wherein the LC tank circuit comprises first and second inductors and first and second varactors, wherein the oscillator circuit generates an oscillator voltage proportional in frequency to an input control voltage supplied to a node between the varactors and proportional in amplitude to an input control current supplied to a node between the first and second PMOS transistors;
 - b. a current source circuit coupled to the oscillator circuit that supplies the input control current to the oscillator circuit;
 - c. a bias circuit coupled to the current source circuit that biases the current source circuit; and
 - d. a feedback loop coupled between the bias circuit and the oscillator circuit, wherein the feedback loop comprises an amplifier having a high

input impedance that is coupled to sense the oscillator voltage and output a current proportional to a positive peak of the oscillator voltage to reduce current flowing into the oscillator circuit from the bias circuit by enough to control the level of swing of the oscillator voltage to a desired level, wherein the amplifier comprises first and second transistors each set nominally in cut-off, the base of the first transistor coupled to a gate of the second PMOS transistor in the oscillator circuit and the base of the second transistor being coupled to a node between one of the inductors and varactors in the LC tank circuit, and resistors connected to the emitters of the first and second transistors such that the value of the resistors control a level at which the first and second transistors turn on and draw current away from the bias circuit.

[c10] 10. The voltage controlled oscillator of claim 9, wherein the bias circuit comprises first and second transistors whose bases are coupled together, a diode having a cathode coupled to the base of the first transistor and to the collector of the second transistor, and a current source coupled to the anode of the diode, wherein a connection is made between the collectors of the first and second transistors of the amplifier and the anode of the diode in the bias circuit to provide a path to draw current away from the second transistor in the bias circuit.

[c11] 11. A method for controlling the amplitude of the output voltage of a voltage controlled oscillator, comprising steps of:
 sensing the output voltage of an oscillator circuit with an amplifier having a high input impedance and which outputs a current proportional to a positive peak of the oscillator voltage; and
 drawing current away from a bias circuit that is used to bias a current source circuit that supplies an input current to the oscillator circuit when the amplifier detects that the amplitude of the oscillator voltage reaches a desired value.